TAXONOMY

Common name: Caspian Tern
Scientific name: *Sterna caspia*
Order: Charadriiformes
Family: Laridae
Subfamily: Sterninae

This widespread species, with disjunct breeding populations on all continents but South America and Antarctica, is considered by most authorities to be monotypic (Cramp 1985; AOU 1957, 1998; Olsen and Larsson 1995).

LEGAL AND CONSERVATION STATUS

United States

The Caspian Tern is designated a nongame migratory bird in the United States and was initially protected under the Convention for the Protection of Migratory Birds (1916) between the United States and Great Britain (acting on behalf of Canada). The Migratory Bird Treaty Act of 1918 established Federal responsibility for the conservation of this and other species of migratory birds. The Caspian Tern is not included on USFWS's list of Migratory Nongame Birds of Management Concern (USFWS 1995), National Audubon Society's Blue List from 1978 to 1986 (Tate 1981, Tate and Tate 1982, Tate 1986), or Partners in Flight's 1996 Watchlist (Carter et al. 1996). A conservation ranking of colonial waterbirds in the North American Waterbird Conservation Plan (NAWCP) places the Caspian Tern in a list of species of "Low Concern" (Kushlan et al. 2002). As of 1997, the Association for Biological Diversity ranked the Caspian Tern globally (rangewide) as Secure (G5) and for its U.S. range as Apparently Secure to Secure as a breeder (N4N5B) (NatureServe 2001). At the state level, the Caspian Tern is considered Endangered in Wisconsin, Threatened in Michigan, and a Species of Special Concern in Montana, New Jersey, Utah, Virginia, and Wyoming (Table 1). The USFWS's Birds of Conservation Concern 2002 (USFWS in prep) includes the Caspian Tern as a species of concern only in the North Pacific Coast Bird Conservation Region (BCR 5), which extends from coastal southern Alaska to coastal northern California (U.S. North American Bird Conservation Initiative Committee 2000). Bird Conservation Regions (BCRs) encompass landscapes having similar bird communities, habitats, and resource issues.

Canada

In 1978, the Committee on the Status of Endangered Wildlife in Canada designated the Caspian Tern as "Rare" (synonymous with "Vulnerable" 1990-1999, "Special Concern" 2000 to present) (COSEWIC 2001). Reexamination in 1999 lead to delisting it to "Not at Risk," despite a recommendation for retention of "Vulnerable" status (James 1999). The NAWCP status applies to Canada as well as the United States. As of 1997, the Association for Biological Diversity ranked the Caspian Tern in Canada as Vulnerable to Apparently Secure as a breeder (N3N4B) (NatureServe 2001). At the provincial/territorial level, the Caspian Tern is listed as Endangered in Québec and a Species of Special Concern (or equivalent) in Northwest Territories, Alberta, British Columbia, Ontario, and Manitoba (Table 1).

Wesloh 1985). These high PCB concentrations are thought to be lowering the reproductive success and juvenile survivorship of Caspian Terns (Grasman et al. 1998).

Impacts of organochlorine pollutants, especially DDE (a breakdown product of DDT), have been documented on the Pacific Coast. Ohlendorf et al. (1985) found high chick mortality in San Diego associated with high DDE levels in eggshells. High DDE levels were also found in egg shells in the San Francisco Bay area (Ohlendorf et al. 1985, 1988). In 1995, residual DDE and other pollutants resuspended by record flooding were also considered to be responsible for a reproductive collapse of a Caspian Tern colony in Elkhorn Slough, California (Parkin 1998). Ludwig et al. (1993) described a similar failure in the Great Lakes also caused by resuspension of contaminants by floodwaters.

These accounts underscore that despite pollutants such as DDE and PCBs being better regulated today, individual Caspian Tern colonies continue to be threatened by them long after they have been banned. Caspian Terns are well suited as sentinel species (Grassman 1998), and hence their colonies should be monitored on a regular basis if they are associated with sources of contaminants, such as manufacturing in the Great Lakes or channel deepening on the Columbia River. In general there are ongoing concerns for the potential risk to waterbirds of reproductive impairment or immunotoxicity from selenium, boron, mercury, DDE, PCBs, and *trans*-nonachlor (Ohlendorf 1985, 1988; Setmire et al. 1990, 1993; Grassman 1996, 1998; Bruehler and de Peyster 1999).

Human Disturbance

Human disturbance is a well known cause of reproductive failure in a wide range of seabirds (Carney and Sydeman 1999, but also see Nisbet 2000 and Carney and Sydeman 2000). Caspian Tern colonies are especially vulnerable during the early courtship and incubation stages (Cuthbert and Wires 1999). Human visitors that approach Caspian Terns during these stages typically cause panic flights of the entire colony. Such human disturbances can lead to permanent nest or colony abandonment (Cuthbert and Wires 1999). Most of the well documented cases of human impact are from research activities, underscoring the vulnerability of Caspian Terns. In a Lake Michigan study, Cuthbert (1981) attributed 22% of reproductive failure to researcher visits that resulted in nest desertion. Shugart et al. (1978) attributed abandonment of nests and eggs by 445 pairs of terns (66% of colony) to a single day of cannon-netting efforts in the first two weeks of incubation. At Rice Island, Oregon, use of a cannon net to capture adults prospecting a traditional breeding location resulted in less than 5% of marked birds returning to that colony site following capture (D. Roby et al. unpubl. data). This low percentage may have also been influenced by the social attraction effort implemented concurrently on East Sand Island.

The impacts of human disturbance are often magnified by the response of predators or the terns themselves. Egg losses may result from adults damaging or kicking their eggs out of the nest when abruptly fleeing human disturbance (Cuthbert and Wires 1999). Similarly, chicks may flee nest sites by swimming and get lost, drown, or die of exposure (Quinn et al. 1996). Fleeing chicks may also be attacked and often killed by neighboring adults (G. Shugart in litt.). The impact of a colony disturbance can be greatly increased when nearby gulls act as egg and chick predators (Penland 1982, Quinn 1984). Although a panic flight of a colony reacting to disturbance may last only a few seconds, gulls at Rice Island stole hundreds of eggs and young chicks per day during these brief disturbances (Collis et al. 2000). The Rice Island colony appeared most vulnerable to gull predation during the early chick stage, when small chicks (5-10 days old) ran from the nest but were still

easily consumed in a single bite by gulls on the wing (D. Craig pers. obs.). Chicks are also particularly vulnerable to humans entering a colony at this stage as evidenced by chick mortality (about 30% died) following a 1-hour banding effort in Grays Harbor (Penland 1981). In subsequent years, chick mortality due to researcher disturbance was avoided by selecting the banding date to be at a stage when most chicks had just hatched and by restricting banding to 20-minute periods (WDFW pers. comm.). In 1998, 72 chicks died at Rice Island from heat exhaustion when too many chicks became crowded together in a holding pen during a mid-day banding effort (D. Craig pers. obs.). Since 2000, banding activities on the Columbia River have been conducted at either dawn or dusk, and groups of about eight nearly-fledged chicks have been held in pheasant crates to minimize crowding (D. Craig pers. obs.). Although researchers often document their impact, the majority of human intrusions and disturbances by the general public are undocumented and their effects unmeasured.

Introduced Species

There are no apparent threats to Caspian Terns directly associated with introduced species. Introduced plants such as tansy ragwort *(Senecio jacobaea),* common evening primrose *(Oenothera biennis),* and European beach grass *(Ammophila arenaria)* may be accelerating the degradation of quality breeding habitat by advancing vegetation succession at a rate faster than that of native plants of the Columbia River (D. Craig pers. obs.). The introduction of non-native mammalian predators has been documented at several colonies, particularly those in conflict with human interests (see Disease and Predation and Concentration Risk).

Population Size and Isolation

Although limited information is available on the size of historic populations, numbers of Caspian Terns have increased markedly in North America in the last 30 years, when relatively good population data have been gathered (Wires and Cuthbert 2000). The species still occupies most of its former range and has expanded into new areas. The continent-wide breeding population numbers at least 32,000 to 34,000 pairs. The current population size itself does not warrant conservation concern. Although there are insufficient data regarding the mixing of Caspian Terns among regions in the breeding or non-breeding seasons, isolation of populations is not an apparent conservation threat. On the other hand, the smallest and most isolated Caspian Tern colonies, such as those in Québec, are in theory vulnerable to not being recolonized after displacement by stochastic events such as catastrophic storms, habitat loss, or disturbance (Martins 1997).

Concentration Risk

Natural and human-caused events have reduced or eliminated habitat at many colonies. In the Pacific Coast region, 8 of 15 historic colonies have been lost or abandoned in the last 20 years (Appendix 1). This has apparently led to terns concentrating on few remaining suitable sites (e.g., Rice Island, Oregon) or colonizing new sites in conflict with human interests (e.g., ASARCO, Ruston, Washington). Shipping traffic on the Columbia River leaves large breeding aggregations of terns, such as those at East Sand Island, especially vulnerable to oil spills or other spilling or shipping accidents. The large breeding concentration in the Columbia River estuary is also more vulnerable to stochastic events (e.g., storms, predators, and human disturbance) and disease (e.g., Newcastle

and botulism) than a comparable population dispersed among many smaller colonies (Klinger 1997, Roby et al. 2002, K. Molina pers. comm.). Natural and human disturbances that cause panic flights at larger colonies may result in significant chick mortalities, as the probability of chicks becoming lost and then killed by adults increases with colony size (Penland 1976, D. Craig pers. obs.). Roby et al. (2002) suggested that in years with poor ocean conditions near large concentrations like East Sand Island there is an increased likelihood of terns being reliant on juvenile salmon. Large concentrations of Caspian Terns are also more likely to engender conflict with fisheries interests and hence may be subjected to organized eradication efforts through introduced predators (e.g., pigs; Buchal 1998).

MONITORING ACTIVITIES

Regional Surveys

Currently, censuses of Caspian Terns in most states, provinces, and territories are conducted as part of periodic, multi-species surveys for various colonial waterbirds. In cases where the colonial waterbird fauna is dominated by larids (gulls, terns, and skimmers) and ciconiiformes (herons, egrets, ibis, and storks), Caspian Terns are usually well surveyed (Texas Colonial Waterbird Society 1982, Blokpoel and Tessier 1996). In other cases where the colonial waterbird fauna is dominated by seabirds (storm-petrels, cormorants, and murres) breeding primarily on offshore rocks and islands, Caspian Terns may not be surveyed directly but ancillary data (often incomplete) may be included in seabird catalogues (Sowls et al. 1980, Carter et al. 1992). In some cases, surveys are conducted annually for a number of years (e.g., Texas, 1973-1980; Texas Colonial Waterbird Society 1982); in others, surveys are at longer intervals (e.g., Great Lakes, about every 10 years; F. Cuthbert in litt.). Some of these broadscale surveys have been funded in response to environmental concerns over disposal of dredge spoils or offshore oil drilling (Chaney et al. 1978, Carter et al. 1992).

Rapid shifts in the distribution and abundance of terns makes it difficult to assess state or local trends over short time periods. For example, the apparent increase of the California population from the early 1980s to late 1990s (Wires and Cuthbert 2000, Table 5, Appendix 1) was largely an artifact of a short-lived increase at the Salton Sea. After 30 pairs recolonized that site in 1992, breeding numbers increased to 1,500 pairs in 1996 then declined to about 200-325 pairs in 1999-2001 (Molina 2001). When accurate data are needed to inform management decisions, more frequent surveys are usually required. This has been the case in the Pacific states, where in response to tern-fisheries conflicts since the late 1990s USFWS and PRBO Conservation Science have coordinated regionwide colony surveys annually since 2000 (see Appendix 1, Table 5).

Breeding Bird Survey

The BBS has been run annually since 1966 and is the only survey that provides trend estimates for the Caspian Tern throughout the United States and Canada (Sauer et al. 2001). BBS methodology, though, is known to be deficient in surveying wetland birds, colonial nesters, and certain other species (Bystrak 1981, Robbins et al. 1986). Peterjohn and Sauer (1997) reported that the BBS provides imprecise trend estimates for the Black Tern *(Chlidonias niger)* resulting from their semicolonial nesting habits, considerable annual fluctuations in population size, and, perhaps, because roadside sampling of wetlands may not be a representative subset of all habitats used by the

species. These drawbacks are probably even greater for the Caspian Tern given its highly colonial nesting habits, the relatively few colonies in any given region, and the disjunct nature of the regional breeding populations in North America. Sauer et al. (2001) calculated BBS trends for the Caspian Tern for 34 regions in the United States and Canada and concluded that the data had an "important deficiency" in 30 regions and a "deficiency" in 4 regions.

Christmas Bird Count

The CBC provides a continentwide perspective on the early winter distribution and abundance of birds in North America. The number of count circles has grown exponentially from 25 in 1900 to 1,823 in 2000 (BirdSource 2001). Analyses of trends are available for some species (through 1988) but not for the Caspian Tern (Sauer et al. 1996).

MANAGEMENT ACTIVITIES

Management strategies for seabirds generally fall into two broad categories: (1) protection at the ecosystem level and (2) active management at the species or colony level (Kress 1998). Management for the Caspian Tern has largely been targeted at the species and colony level via these general measures (often used in combination): habitat and vegetation management, use of artificial nest substrates, social attraction, predator management, and minimization of disturbance. A current management plan to resolve fisheries conflicts in the lower Columbia River estuary seeks to manage Caspian Terns on a regional level by a multi-faceted, step-wise approach (Interagency Caspian Tern Working Group 2000). The goal is to reduce predation rates on at-risk salmonid populations by dispersing the Columbia River's highly concentrated terns to a number of smaller colonies over a wider area, thereby minimizing the impacts of the terns on any one fishery. These efforts will be part of a long-range comprehensive plan in support of recovery efforts for salmonids in the Columbia River Basin, which includes habitat enhancement and management of harvest, hatchery production, and hydroelectric operations.

Whether management is focused at the colony, regional, or ecosystem level, effective techniques and strategies will vary among sites or at the same site over time. Hence, management and selection of restoration sites must be fine tuned to local conditions and constraints, both biological and political, and adaptively modified as new information is gained, particularly as novel methods are tried and perfected (Kress 1998). Given seabirds are long-lived, management and restoration projects must of necessity be long-term in nature (measured by the decade rather than year), and, thus, to be effective require extraordinary commitment of individuals and administrative and financial support.

Management Activities in the Columbia River Estuary

Under the Endangered Species Act, the National Marine Fisheries Service (NMFS) and USFWS are responsible for assessing the potential impacts of federal actions on species listed as federally threatened or endangered. Where potential adverse effects may result from a federal action, NMFS and/or USFWS issues Biological Opinions (BO) to the federal action agency with mandatory terms and conditions and discretionary conservation recommendations to reduce impacts.

In 1995, NMFS issued a BO for listed salmonids on the Operation of the Federal Columbia River Power System to the Corps of Engineers (Corps). NMFS required the Corps to "...conduct studies to identify (a) Caspian tern predation of juvenile salmonids, and (b) methods to discourage tern nesting..." Research was initiated in 1997 to estimate the number of smolts consumed by Caspian Terns in the Columbia River estuary. Research results from 1997 and 1998 indicated that Caspian Terns nesting on Rice Island consumed more juvenile salmonids than any other prey type (Roby et al. 1998). In response to these findings, NMFS requested immediate remedial action to reduce impacts to threatened salmon.

In 1999, NMFS issued a second BO to the Corps with direction to manage the magnitude of Caspian Tern predation in the estuary. This BO on the Columbia River Channel Operation and Maintenance Program required the Corps to "...modify the habitat on Rice Island by April 1, 2000, so that it is no longer suitable as a nesting site for Caspian terns or provide for the hazing of terns off the island in a manner that will preclude their nesting..." The requirement was designed to reduce levels of tern predation on out-migrating smolts.

In 1999 and 2000, the Corps attempted to relocate the Rice Island Caspian Tern colony to East Sand Island, an island closer to the mouth of the Columbia River than Rice Island. This action was designed to meet the stipulations in the 1999 NMFS BO to eliminate tern nesting on Rice Island, reduce tern predation on salmon smolts, and provide appropriate habitat for the Caspian Tern population displaced by the project.

In 2000, Seattle Audubon, National Audubon, American Bird Conservancy, and Defenders of Wildlife filed a lawsuit against the Corps and USFWS on the basis that compliance with the National Environmental Policy Act for the proposed action was insufficient and in objection to the potential take of eggs as a means to prevent nesting on Rice Island. In 2002, all parties reached a settlement agreement. Terms of the agreement require the provision of approximately six acres of habitat for Caspian Terns on East Sand Island and the prohibition of lethal take of adults or eggs on Rice Island. The settlement agreement also stipulates federal agencies will complete three technical reports. These include an avian predation analysis to assess the significance and effect of Caspian Tern predation on salmon recovery in the Columbia River estuary, a Caspian Tern status assessment (this document) to review the distribution, abundance, and conservation needs of Caspian Terns in North America, and a feasibility analysis of establishing alternate nesting sites for some of the terns in the Columbia River estuary. Additionally, USFWS, NMFS, and Corps will prepare an Environmental Impact Statement to address salmon smolt predation and Caspian Tern management in the Columbia River estuary.

Habitat and Vegetation Management

Habitat has been altered or created in various ways to enhance (or sometimes decrease) its suitability for nesting Caspian Terns. Creation of suitable habitat may involve construction of artificial islands designed for use by multiple species, as was done in Hamilton Harbour, Ontario (Quinn et al. 1996). Important overall design features of these islands were (1) the ability to withstand 25 to 50 year flood events (base of coarse rocks, the largest placed on windward side), (2) an area of calm water on the lee side allowing growth of submerged vegetation and fish spawning habitat to increase the number of species and population sizes of fish, and (3) the preparation of various areas with

SUMMARY

Despite recent population increases, the Caspian Tern *(Sterna caspia)* is of conservation concern in the Pacific Northwest because of the concentration of breeding terns at relatively few sites and fisheries conflicts at the Columbia River estuary, where currently two-thirds of the Pacific Coast and one-quarter of the North American population occurs. Although not listed at the national level, the species currently is listed as threatened or endangered in three states or provinces and is considered of special concern in ten more. The Caspian Tern still occupies most of its historic range and has expanded slightly into new areas.

Historically the Caspian Tern suffered from harvest for the millinery trade, egging, human disturbance, habitat loss at interior wetlands, and, more recently, from contaminants. Historic population numbers are unknown but appear to have been substantially reduced early in the century. Relatively accurate population data for the Caspian Tern in North America were unavailable until the late 1970s, when concerns over coastal habitat modification and offshore oil development prompted national multi-species surveys of colonial nesting waterbirds. Estimates of the U.S. breeding population were roughly 9,454 pairs in the mid-1970s to early 1980s and 20,948 pairs in the late 1980s to late 1990s. Since the late 1970s, the population has increased in four of five major breeding regions in North America, and the continental population is estimated to be a minimum of 32,000 to 34,000 pairs, distributed differentially among regions: Pacific Coast/Western (interior) (45%), Central Canada (28%), Great Lakes (19%), Gulf Coast (7%), and Atlantic Coast (<1%).

Continentwide population increases were fueled initially by the reduction or elimination of some historic pressures (e.g., hunting for millinery trade) but more recently by changes in breeding habitat and prey resources. Occupation of relatively stable artificial habitats (e.g., dredge spoil islands) has greatly concentrated the tern population leaving it more vulnerable to stochastic events, such as disease outbreaks, severe storms, disruption by predators or human disturbance, and oil spills. Caspian Tern population increases in the Pacific region from the mid-1980s to 2001, primarily in the Columbia River estuary, may largely reflect the crucial juxtaposition of stable human-created habitats in conjunction with a predictable food supply. Human exploitation of native fish communities leading to dominance of small fish species favored by foraging terns appears to be a significant factor in tern increases in the Great Lakes and central Canada.

Conservation efforts will be most effective if focused on multiple fronts including monitoring tern populations, resolving management conflicts with other species by addressing root causes, reducing risks to the tern population by distributing breeding colonies among a greater number of sites, filling gaps in knowledge of biology and threats on migration and the wintering grounds, and educating the public about the value of colonial waterbirds and possible effects of human actions on Caspian Terns.

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TABLE 1. Government and Natural Heritage conservation status rankings for the Caspian Tern in 30 states, provinces, and territories in North America by five distinct breeding populations (after Wires and Cuthbert 2000).

REGION - STATE, PROVINCE, OR TERRITORY	GOVERNMENT	NATURAL HERITAGE STATUS[a]
PACIFIC COAST/WESTERN		
Alaska	no status[b]	Vulnerable
British Columbia	Blue List (vulnerable)[c]	Vulnerable
Washington	no status[b]	Apparently Secure – Secure
Oregon	no status[b]	Apparently Secure?
California	no status[b]	Apparently Secure
Idaho	no status[b]	Critically Imperiled
Montana	Species of Special Concern	Imperiled
Wyoming	Species of Special Concern	Critically Imperiled
Nevada	no status[b]	Vulnerable – Apparently Secure
Utah	Species of Special Concern	Critically Imperiled
CENTRAL CANADA		
Northwest Territories	Sensitive	unranked
Alberta	Sensitive	Imperiled
Saskatchewan	no status[b]	Imperiled
Manitoba	Species of Special Concern	Vulnerable
GREAT LAKES		
Indiana	no status[b]	accidental breeder
Michigan	**STATE THREATENED**	Imperiled
Wisconsin	**STATE ENDANGERED**	Critically Imperiled
New York	no status[b]	Critically Imperiled
Ontario	Vulnerable (Species of Special Concern)	Vulnerable
Minnesota	no status[b]	unranked
ATLANTIC COAST		
Newfoundland and Labrador	no status[b]	Critically Imperiled
Quebec	**PROVINCIALLY ENDANGERED**	Critically Imperiled
New Jersey	Species of Special Concern	no status assigned
Virginia	Species of Special Concern	Critically Imperiled
North Carolina	no status[b]	Critically Imperiled
GULF COAST		
Texas	no status[b]	Apparently Secure
Louisiana	no status[b]	Critically Imperiled – Imperiled
Alabama	no status[b]	Imperiled
Mississippi	no status[b]	accidental breeder
Florida	no status[b]	Imperiled

[a] These are the verbal definitions of the Association of Biodiversity Information's standardized Subnational (state or provincial level) Heritage Status Ranks signifying a numeric rank of relative imperilment (see the section on Conventions Used in the Text for additional details).

[b] "No status" indicates that for a particular state or province the species is not listed as threatened or endangered nor is it given a specific conservation status designation such as "species of special concern" (or equivalent). It varies by state or province, though, whether the species is considered "protected" by a statue or rule as it is federally under the Migratory Bird Treaty Act.

[c] Blue List are indigenous species or subspecies considered to be Vulnerable (at risk), i.e. are of special concern because of characteristics that make them particularly sensitive to human activities or natural events.

Mexico

The Caspian Tern was included in the Convention between the United States of America and the United Mexican States for the Protection of Migratory Birds and Game Mammals in 1936, but the species is not protected under any specific legal status in Mexico and is not listed by the IUCN or CITES (InfoNatura 2001). The NAWCP status applies to Mexico as well as to Canada and the United States.

Central and South Americas

The Caspian Tern has no legal status in Central or South America and is not listed by the IUCN or CITES (InfoNatura 2001). The NAWCP status applies to Central America and the Caribbean (exclusive of islands associated with South American nations) as well as to Canada, the United States, and Mexico.

DESCRIPTION

The Caspian Tern is the largest tern, and its heavy build, broad-wings with bold black wedge on underside of outer primaries, and stout, conspicuous red bill render it unmistakable. In alternate plumage, adults have a black cap and short crest but otherwise white head, neck, and underparts; upperparts are pale gray with a white rump and tail (some tail feathers may be pale gray and outer primaries slightly darker); and underwings are white with a bold blackish patch on outer primaries (Howell and Webb 1995, Olsen and Larsson 1995). The bill is bright red to orange-red with a black subterminal ring and fine pale tip, legs and feet are black (orange to pink soles) and eye dark (set within dark cap). Adult basic plumage (from mid-summer) is much like alternate but with forecrown streaked or freckled white, bill duller than in summer (with broader black ring around tip), and outer primaries often darker (through wear). In juveniles, the black cap is streaked whitish to buff, narrow pale eye-ring present, upperparts have brown chevrons and spots, secondaries dusky terminally, tertials dark (edged white), and tail is pale gray with a darker subterminal band. Juvenile bill is reddish orange to orange with a dark tip, and legs are dull orange, soon becoming black. First summer plumage is much like adult basic but often shows dark carpal bar, bar on secondaries, dark outer primaries, and incomplete tail band; in second summer, may show white flecks in black cap and darker outer primaries than in adult.

GEOGRAPHIC DISTRIBUTION

Breeding

In North America, the Caspian Tern breeds at widely scattered sites across the continent (Figure 1). In outlining patterns of regional distribution, we follow Wires and Cuthbert's (2000) descriptions of five more-or-less disjunct breeding regions (Figure 2). We recognize, though, that future advances in knowledge may warrant adjustment of regional boundaries, as greater clarity is needed, particularly with respect to small interior colonies in Idaho, Utah, Montana, Wyoming, and North Dakota. For additional details see Cuthbert and Wires (1999), Wires and Cuthbert (2000), and pertinent sections of this report, on which the following summaries are based:

Fig. 1. Seasonal distribution of the Caspian Tern in North, Central, and South America. The species winters locally within the dashed line. Adapted with permission from Figure 1 in Cuthbert and Wires (1999).

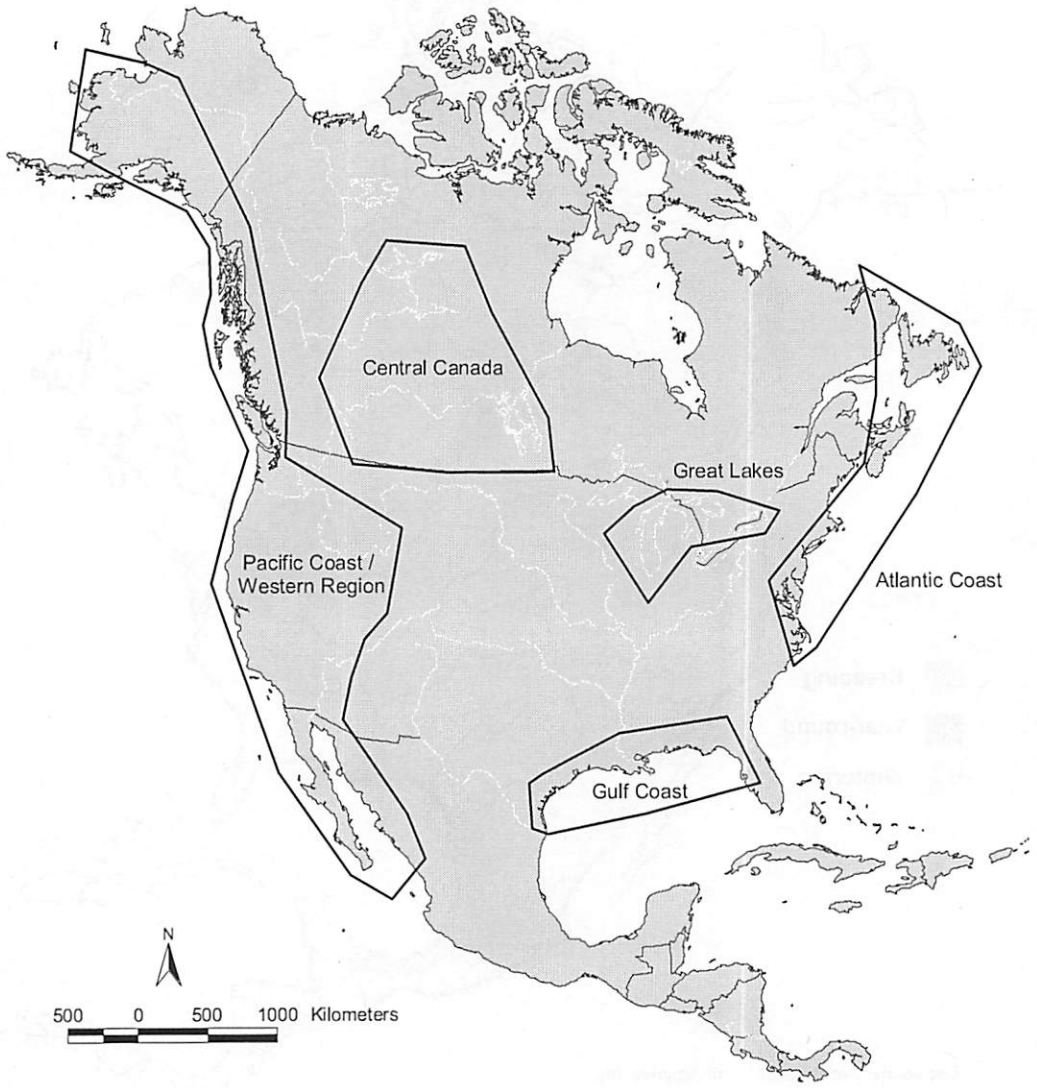

Fig. 2. Outlines of five more-or-less distinct breeding regions of the Caspian Tern in North America, after Wires and Cuthbert (2000). Regional boundaries may need refinement after further study (see text).

(1) Pacific Coast/Western (interior) Region – a very rare and recent breeder in coastal Alaska and southwestern British Columbia; a locally uncommon to abundant breeder along the coast of Washington, Oregon, and California; a locally uncommon to common breeder on the west coast of Baja California, Sinaloa, Mexico, and in the interior of Washington, Oregon, California, southern Idaho, Montana, Wyoming, western Nevada, and northern Utah.
(2) Central Canada – a locally rare to uncommon breeder in the Northwest Territories (Great Slave Lake), Alberta, central Saskatchewan, and a locally uncommon to abundant breeder in south-central Manitoba (mainly lakes Winnipeg and Winnipegosis).
(3) Great Lakes – an uncommon to abundant breeder on Lake Michigan (Indiana [rare], Michigan, Wisconsin [rare]), Lake Ontario (Ontario, New York), and Lake Huron (Ontario, Michigan).
(4) Atlantic Coast – a locally rare to uncommon breeder in Labrador, Newfoundland, southeastern Québec, Virginia, North Carolina and formerly, New Jersey, South Carolina, and Florida.
(5) Gulf Coast – a locally fairly common breeder at scattered sites from coastal Texas to Tampa Bay, Florida (very rare in Mississippi).

MIGRATION

Although recorded year round in breeding areas on the southern Pacific Coast (southern California, west coast of Baja California, and Sinaloa), Gulf Coast, and southern Atlantic Coast (North Carolina southward), it is unclear if individuals remain in these areas all year or if there is replacement by, or mixing with, birds from other breeding populations. Still, most Caspian Terns in North America are highly migratory. Juveniles in fall migrate to wintering areas where they remain through their first full year; subadult (second year) birds may remain to summer on the winter grounds or return to breeding areas, whereas almost all third year and older birds migrate to and from breeding and wintering areas seasonally (Ludwig 1965, Gill and Mewaldt 1983, L'Arrivée and Blokpoel 1988). Migration generally occurs from August through October in fall and in April and May in spring. Despite the protracted period of migration in fall, individual birds may migrate fairly rapidly, as indicated by recoveries of a Great Lakes banded juvenile in the Dominican Republic in August (date unknown) and an adult in Columbia on 3 September (L'Arrivée and Blokpoel 1988).

Caspian Terns breeding on the Pacific Coast of Washington and California appear to migrate along the coast to reach wintering areas on the west coast of Mexico and Guatemala (Gill and Mewaldt 1983). Average distances traveled to the wintering grounds from major colonies at Grays Harbor, Washington, and San Francisco Bay and San Diego Bay, California, were 2,550 km, 1,930 km, and 1,640 km, respectively. Still, on average terns from Grays Harbor wintered farthest north and those from San Diego farthest south, suggesting there may be some segregation on the wintering grounds dependent on natal origin. Gill and Mewaldt (1983) reported that some newly fledged birds disperse north in late summer before migrating south; in two cases, hatching year birds were recovered 800 and 1,500 km north of their natal colonies 2 months following banding. These may be the terns from San Francisco Bay that dispersed northward as far as interior Washington and Alberta (Gill and Mewaldt 1979). Most resightings during the post-breeding period of Caspian Terns banded at colonies in the Columbia River estuary are from the coasts of Oregon, Washington, and British Columbia (north toVancouver) and east to up-river tern colonies in the mid-Columbia River (Collis et al. 2000, 2001b). Later resightings have been from along the Pacific Coast south to Manzanillo, Mexico. Collectively, these data suggest that terns may disperse northward along the coast before

heading south to overwinter. From the extreme outlying breeding colony in the Bering Sea at Neragon Island, Alaska, the potential migration distances are 4,300 km to the nearest Asian wintering area in Japan and nearly 5,000 km to the main wintering area in western North America in west Mexico (McCaffery et al. 1997).

Although migrants from some colonies in the interior of Oregon apparently follow the Columbia River to the Pacific Ocean (Gilligan et al. 1994), it is unclear if all or even most birds in the western interior pursue such a trajectory. Of four recoveries on the wintering grounds from birds banded in the interior of California, Idaho, and Nevada, two were from the west coast of Mexico along the Gulf of California and two from the central interior of Mexico (Gill and Mewaldt 1983). Although this sample size is very small, it suggests that terns from the interior of the western United States may take a direct overland route to reach wintering areas rather than moving diagonally to the Pacific Coast of the United States before continuing south.

Band recoveries indicate Great Lakes' terns migrate to and from wintering areas on the Gulf and Atlantic coasts, the Caribbean, and northern South America via the Atlantic Coast and the Mississippi Flyway. At both seasons, birds apparently move between the Great Lakes and the mid-Atlantic region via lakes Erie and Ontario and traversal of New York and Pennsylvania (Ludwig 1965, L'Arrivée and Blokpoel 1988). The average distance banded birds traveled from the Great Lakes to areas where recovered in winter (Nov-Feb, $n = 46$ birds) was 2000 km (Ludwig 1942). Banded birds from the Great Lakes have dispersed well out of range to reach Manitoba, Nova Scotia, Newfoundland, the Pacific Coast of Columbia, and even England; evidence of some birds from Atlantic Canada suggest they were storm-driven (Ludwig 1965, L'Arrivée and Blokpoel 1988).

Very little appears to be known about the migration pathways of populations breeding in central Canada, the Atlantic Coast, and the Gulf Coast. On geographic grounds, it seems likely that Atlantic Coast birds follow the coastline south to winter in areas similar to those occupied by Great Lakes birds and return by the same route. Likewise, many Gulf Coast terns likely migrate along the coast to winter on the east coast of Mexico and perhaps Central America and the Caribbean Basin. Geography does not suggest whether terns from central Canada pass southward down the center of the continent, cross the Rockies to the Pacific Coast, move to the Atlantic Coast via the Great Lakes, or follow a combination of these depending on the colony of origin.

Also unknown are the sources of birds representing outlying records from areas such as the Hawaiian Islands (Oahu, Maui, and Hawaii) or the interior of western North America north to east-central Alaska and west-central Yukon (AOU 1998).

Winter

In the Americas, the Caspian Tern winters primarily on the Pacific Coast from southern California south through west Mexico and (locally) Central America; inland in the Central Volcanic Belt and Atlantic (Gulf) Slope of Mexico; along the southern Atlantic Coast of the United States, the Gulf Coast of the United States and Mexico, (locally) along the Caribbean/Atlantic coast of Central America and northern South America; and locally in the West Indies (Figure 1). Details of regional distribution are provided below.

Pacific Coast

Along and near the Pacific Coast, the Caspian Tern winters mainly from southern California south through Baja California, the Gulf of California, and west Mexico to Guatemala (Howell and Webb 1995, BirdSource 2001). Band recoveries are concentrated on the central coast of west Mexico (Gill and Mewaldt 1983). Although unrecorded from El Salvador (Howell and Webb 1995), the species occurs on the Pacific Coast of Nicaragua (single inland record), Costa Rica (small numbers Golfo de Nicoya), and Panama (rare) (L'Arrivée and Blokpoel 1988, Ridgely and Gwynne 1989, Stiles and Skutch 1989). Single extralimital records are known for the Pacific Coast/slope of Columbia and Ecuador (L'Arrivée and Blokpoel 1988, Ridgely and Greenfield 2001). Data for Pacific Coast terns suggests there is some segregation on the wintering grounds dependent on natal origin, but sample sizes are too small to quantify how much mixing occurs (Gill and Mewaldt 1983).

Recent Christmas Bird Count (CBC) data (1991-2000; BirdSource 2001) show the northern limit of the regular winter range in California to be at Morro Bay, San Luis Obispo County, on the southern coast (range = 3-23 birds/year, median = 9), though a few individuals now winter disjunctly on the northern coast at Humboldt Bay (range = 1-8, median = 3.5; combined data for two CBCs). The Caspian Tern formerly wintered regularly on the California coast only as far north as Pt. Migu, Ventura County (Garrett and Dunn 1981). In winter, the species is casual inland in central and southern California away from the immediate coast (e.g., San Joaquin Valley) except at the Salton Sea, where numbers of wintering birds (range = 18-413, median = 27; combined data for two CBCs) may in some years rival or exceed those at sites on the southern California coast (range = 55-221, median = 139; combined data for various CBCs). Highest winter numbers at the Salton Sea from 1995-1997 (413, 197, 109) preceded peak breeding numbers there in 1996-1998 (Molina 2001).

Atlantic, Gulf, and Caribbean Coasts

On the Atlantic and Gulf Coasts, the species winters regularly from southern North Carolina south around Florida to south Texas and south along Mexico to Honduras (Howell and Webb 1995, Bird Source 2001). On the Caribbean Coast/slope, the species is unrecorded in Nicaragua and Costa Rica (L'Arrivée and Blokpoel 1988, Stiles and Skutch 1989) but winters in small numbers in Panama (especially Canal area), Columbia (most from Cartagena to Santa Marta; inland along lower Magdalena River), and northwestern Venezuela (Hilty and Brown 1986, L'Arrivée and Blokpoel 1988, Ridgely and Gwynne 1989). Extralimital winter records to the north are from Michigan, Nova Scotia, and New Jersey (L'Arrivée and Blokpoel 1988, Sibley 1993) and to the south from Trinidad and French Guiana (Ffrench 1991, AOU 1998).

The Caspian Tern also winters inland in the United States, usually in smaller numbers, on large lakes and rivers of the coastal plain of Georgia, Alabama, Louisiana, Texas, and, most widely, on the Florida Peninsula (Lowery 1974, Oberholser 1974, Imhof 1976, Root 1988, Stevenson and Anderson 1994) and in Mexico, bridging the Pacific and Gulf coasts, in the Central Volcanic Belt and on the Atlantic Slope from Tamaulipas to Tabasco (Howell and Webb 1995).

In the West Indies, the Caspian Tern is rare and local in winter in the southern Bahamas, Cuba, Jamaica, Hispaniola, and Barbados; very rare on Puerto Rico and the Cayman Islands; and a vagrant in the northern Bahamas, St. Croix in the Virgin Islands, and the Lesser Antilles (St. Christopher, Antigua, Dominica, Martinique, and St. Lucia) (Raffaele et al. 1998).

Other than anecdotal observations, CBC data for the United States appear to be the only quantitative information available on the winter abundance of the Caspian Tern. Recent (1991-2000) counts show the bulk of the U.S. wintering population occurs in the Gulf Coast states and the Atlantic Coast of Florida (Table 2). Within that region, Root (1988) reported highest numbers on the Gulf Coast of Texas, from a bit north of Houston to south of Corpus Christi, and the east coast of Florida, just south of Cocoa Beach.

Summer Nonbreeding

Small numbers of Caspian Terns oversummer throughout most of the wintering range (Ludwig 1965, Gill and Mewaldt 1983, Hilty and Brown 1986, L'Arrivée and Blokpoel 1988, Stiles and Skutch 1989, Howell and Webb 1995, Raffaele et al. 1998). Others may occur in mid-summer within the general breeding range, but away from known colonies (Gill and Mewaldt 1983, Bayer 1984), or at areas along migratory pathways outside the breeding range (Zeranski and Baptist 1990, Sibley 1993). Although some birds at known migrant areas in summer may be failed adult breeders or wandering subadults, most birds on the wintering grounds at that season are young birds. Immature Caspian Terns (age 6-18 months) apparently spend all four seasons in the adult wintering range, as do some sub-adults (age 18-30 months) (Gill and Mewaldt 1983, L'Arrivée and Blokpoel 1988).

TABLE 2. Counts of Caspian Terns on Christmas Bird Counts in Canada and the continental United States, 1991-2000.[a]

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Ontario	1	1	0	0	0	0	0	0	0	0
Washington	0	0	1	0	0	0	1	0	0	0
California	161	154	83	108	508	297	265	265	245	184
Arizona	37	26	3	41	22	4	9	0	2	2
Indiana	0	0	0	0	0	0	0	1	0	0
Ohio	0	0	1	0	0	0	0	0	0	0
Texas	926	913	1,130	1,096	834	925	1,411	1,685	1,647	686
Louisiana	638	422	523	319	201	364	577	408	313	257
Mississippi	128	59	83	100	88	106	147	94	86	75
Alabama	83	38	98	19	112	20	70	89	48	73
Florida	585	590	645	532	543	629	635	906	1,135	715
North Carolina	14	15	17	11	3	2	4	1	1	0
South Carolina	119	47	63	106	109	16	120	16	27	20
Georgia	27	40	29	16	14	4	35	8	13	6
TOTAL	2,719	2,305	2,676	2,348	2,434	2,367	3,274	3,473	3,517	2,018[b]

[a] Numbers are raw counts summed over all CBCs on which the species was recorded in a particular state in a given year. Numbers are *not* adjusted to account for the number of counts conducted or for party hours or party miles. Data from BirdSource (2001).

[b] One Caspian Tern was also recorded on a CBC in Hawaii in 2000.